

THE SPECIES OF *RHABDITIS* (NEMATODA) FOUND IN ROTTING SEAWEED ON BRITISH BEACHES

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SYNOPSIS

Rhabditis marina Bastian, 1865, is reported from several localities on the South Coast of England and from Aberdeen, Scotland. Although this species has been reported from several localities in Europe and in North and South America these are the first records of its occurrence in Britain since it was originally described from Falmouth. *Rhabditis ehrenbaumi* Bresslau and Schuurmans Stekhoven, 1935, originally reported from Heligoland, is reported from the South and West Coasts of England and Wales: these are the first records of this species since the original description. Both species are fully redescribed and none of the varieties of *Rh. marina* which have been described or named are accepted with the exception of *Rh. m. var. bengalensis* Timm, 1956, which is considered to represent a distinct species *Rh. bengalensis*. *Rh. m. var. nidyo-siensis* Allgén, 1933, is considered to be a *nomen dubium*. *Rh. velata* Bresslau and Schuurmans Stekhoven, 1935, is considered to be a synonym of *Rh. marina* and further evidence is presented supporting the treatment of *Rh. fluviatilis* Bütschli, 1876, as a synonym of *Rh. marina*. The occurrence of *Rh. marina* is discussed and it is considered to be a form which, although found away from beaches, must be considered a normal member of the beach fauna, typically occurring in rotting seaweed and that its occurrence in beach pools must be considered accidental. It is suggested, tentatively, that *Rh. ehrenbaumi* is probably not a typical beach form but insufficient is known about its distribution for any definite conclusions to be drawn.

THE species of *Rhabditis* most frequently reported from marine habitats is *Rhabditis marina* which was described by Bastian (1865) from specimens found in sand from tide-pools at Falmouth, England. Subsequently six varieties of this species have been described or named, and it has been reported, in one form or another, from the coasts of Europe, the Atlantic coast of the United States of America, the coast of Brazil, the coast of Pakistan, from the South Pacific (Campbell Island) and from the Falkland Islands. It has not, however, been reported from the coast of Britain since the original description. Although we have been unable to find it at Falmouth, we have found specimens at several localities on the South and West Coast of England and have received specimens from Scotland. A full redescription of *Rh. marina* is given below and we are able to demonstrate that some at least of the characters used to differentiate the various varieties are simply due to intraspecific variation.

Two further "marine" species of *Rhabditis* (*Rh. ehrenbaumi* and *Rh. velata*) were described by Bresslau & Schuurmans Stekhoven (in Schuurmans Stekhoven, 1935; Bresslau & Schuurmans Stekhoven, 1940) from Heligoland and neither has been reported since. We have found specimens of the first species on the South and West Coast of England and the South Coast of Wales and a redescription of it is given below. One male specimen which at first sight appeared to belong to the second species was

received from Scotland, but a detailed study demonstrated that the apparently distinguishing characters were in fact due to poor preservation and we consider *Rh. velata* a synonym of *Rh. marina*.

Rhabditis (Pellioiditis) marina Bastian, 1865

Synonymy:

- Rhabditis marina* Bastian, 1865. *Trans. Linn. Soc. Lond.* **25**, 129. Pl. 10, Figs. 60-62.
Rhabditis fluviatilis Bütschli, 1876. *Z. wiss. Zool.* **26**: 365. Taf. XXIV, fig. 8.
Rhabditis marina var. *septentrionalis* Steiner, 1921. *Zool. Jb. (Syst. etc.)* **44**: 10 (= *Rh. marina* of Steiner, 1916. *Zool. Jb. (Syst. etc.)* **39**: 518. Taf. 18, figs. 1a-g.)
Rhabditis marina var. *kielensis* Schulz, 1932. *Zool. Jb. (Syst. etc.)* **62**: 419. Fig. 49a-e.
Rhabditis marina var. *damica* Allgén, 1933. *Capita Zool.* **4**: 123 (= *Rh. marina* of Ditlevsen, 1912. *Vidensk. Medd. naturh. Foren. Kbh.* **64**: 240. Pl. II, figs. 1-5, 7.)
Rhabditis velata Bresslau & Schuurmans Stekhoven, in Schuurmans Stekhoven, 1935. *Tierwelt N.-u. Ostsee.* **5**: 155. Fig. 338.
Rhabditis (Choriorhabditis) fluviatilis, Osche, 1952. *Zool. Jb. (Syst. etc.)* **81**: 263.
Rhabditis (Choriorhabditis) velata, Osche, 1952. *Zool. Jb. (Syst. etc.)* **81**: 264.
Rhabditis (Caenorhabditis) marina, Osche, 1952. *Zool. Jb. (Syst. etc.)* **81**: 265.
Rhabditis (Choriorhabditis) marina marina, Osche, 1954. *Zool. Anz.* **152**: 247.
Rhabditis (Pellioiditis) fluviatilis, Dougherty, 1955. *J. Helminth.* **29**: 131.
Rhabditis (Pellioiditis) velata, Dougherty, 1955. *J. Helminth.* **29**: 131.
Rhabditis (Pellioiditis) marina, Dougherty, 1955. *J. Helminth.* **29**: 132.
nec *Rhabditis (Choriorhabditis) marina* var. *bengalensis* Timm, 1956. *J. Bombay nat. Hist. Soc.* **54**: 87. Figs. A and B (= *Rh. bengalensis*).

Type locality: In sand from tide-pools, Falmouth, south coast of England.

Material studied

Fifty-nine specimens (B.M. (N.H.) Reg. Nos. 1958.12.5.31-60; 1960.2-30) from rotting sea-weed on beach at Downderry, Cornwall (11 ♂, 11 ♀ measured). Other specimens have been studied, but not measured, from the following localities: Littlehampton, Sussex; West Wittering, Sussex; Parson and Clerk Rock, nr. Holcombe (between Dawlish and Teignmouth), Devon; Sunny Cove, East Portle-mouth (Salcombe Estuary), S. Devon; Sennen Cove, Sennen (near Land's End), Cornwall (larvae only); Weston-Super-Mare, Somerset; Aberdeen, Scotland. All these specimens were found in association with rotting sea-weed.

Geographical distribution

Barents Sea (Steiner, 1916); Denmark, coast of (Ditlevsen, 1912); Germany, Baltic coast (Schulz, 1932); Kiel Bay, Germany (Otto, 1936; Gerlach, 1954a); Ostend (De Coninck & Schuurmans Stekhoven, 1933) and Zeebrugge (Schuurmans Stekhoven, 1935a), Belgium; West Sweden (Allgén, 1950); Heligoland, North Sea (Bresslau & Schuurmans Stekhoven, 1940); Mediterranean—Italy and Algeria (Osche, 1954); Coast of Algeria (Gerlach, 1954b); Woods Hole (Timm, 1956) and Long Island, N.Y., Atlantic Coast of the U.S.A. (Chitwood, 1951); Pernambuco, Brazil (Gerlach, 1956); ? Campbell Island, South Pacific (Allgén, 1932); Falkland Islands, Port William (Allgén, 1959); Falmouth (Bastian, 1865), and other localities



in England and Scotland listed above (present authors). Several localities (not beaches) in Germany (Bütschli, 1876; Hirschmann, 1952; Meyl, 1955) and from Hungary (Andrássy, 1958).

Measurements (specimens fixed in "Taf" and mounted in glycerine).

Males—($n = 11$). $L. = 1.40-1.75 (1.59 \pm 0.112)$. $a = 13.2-23.8 (19.55 \pm 3.03)$.
 $b = 5.6-6.9 (0.43 \pm 0.482)$. $c = 17.6-23.4 (20.20 \pm 2.12)$.

Females—($n = 11$). $L. = 1.61-2.42 (1.90 \pm 0.262)$. $a = 14.6-21.7 (18.5 \pm 1.97)$.
 $b = 6.2-8.6 (6.9 \pm 0.89)$. $c = 12.4-18.6 (15.2 \pm 1.89)$. $V. = 50-56 (53 \pm 1.55)$.

MORPHOLOGY

General

The body is relatively narrow and terminates in a relatively long tail in both sexes; laterally it carries well defined lateral fields which have eight incisions about the middle part of the body length where the fields are about one fifth the diameter of the body in width. The oesophagus is typical of *Rhabditis* with a distinct middle bulb and a poorly developed posterior bulb, the valves of which bear a series of semi-elliptical concentric ridges. The oesophagus anterior to the middle bulb is markedly wider than the part posterior to that bulb.

Head

The head appears to carry a full complement of sixteen papillae which are arranged in three circles (Text-fig. 2e); two pairs, dorso- and ventro-lateral in position, in an outer circle; three pairs in an intermediate circle and (?) three pairs in an inner circle. The papillae of the outer and intermediate circles are setiform and have been seen very clearly particularly in some of the specimens from Scotland, but those of the inner circle appear to be sessile and it is not certain that they do in fact exist. The amphids are slightly dorso-lateral in position and are prominent with large openings (Text-fig. 2e and f). The mouth opening is bounded by six lip-lobes which are not off-set from the body and are free from each other at their ends nearer the central axis of the body, but pass backwards onto the surrounding head where they form six prominences on which are located the papillae and the amphids. The buccal cavity (cheilostome) is circular in cross section and is divided anteriorly into six pointed processes, one of which corresponds with each lip-lobe. The prostome is triangular in cross section, this being the triangular structure shown in Text-fig. 2e. The metastome bears a series of five tubercle-like structures and the base of the stoma is surrounded by an oesophageal "sleeve", i.e. muscular tissue extends anteriorly around the posterior part of the stoma.

Male

The tail is relatively long and narrow with broad caudal alae which continue round the posterior tip, i.e. the tail is *peloderan*. The alae are supported by nine

FIG. 1. *Rhabditis marina*, female containing eggs and larvae (a), male (d); *Rhabditis ehrenbaumi*, female (b), male (c). All figures to same scale. (Scale line = 0.5 mm.)

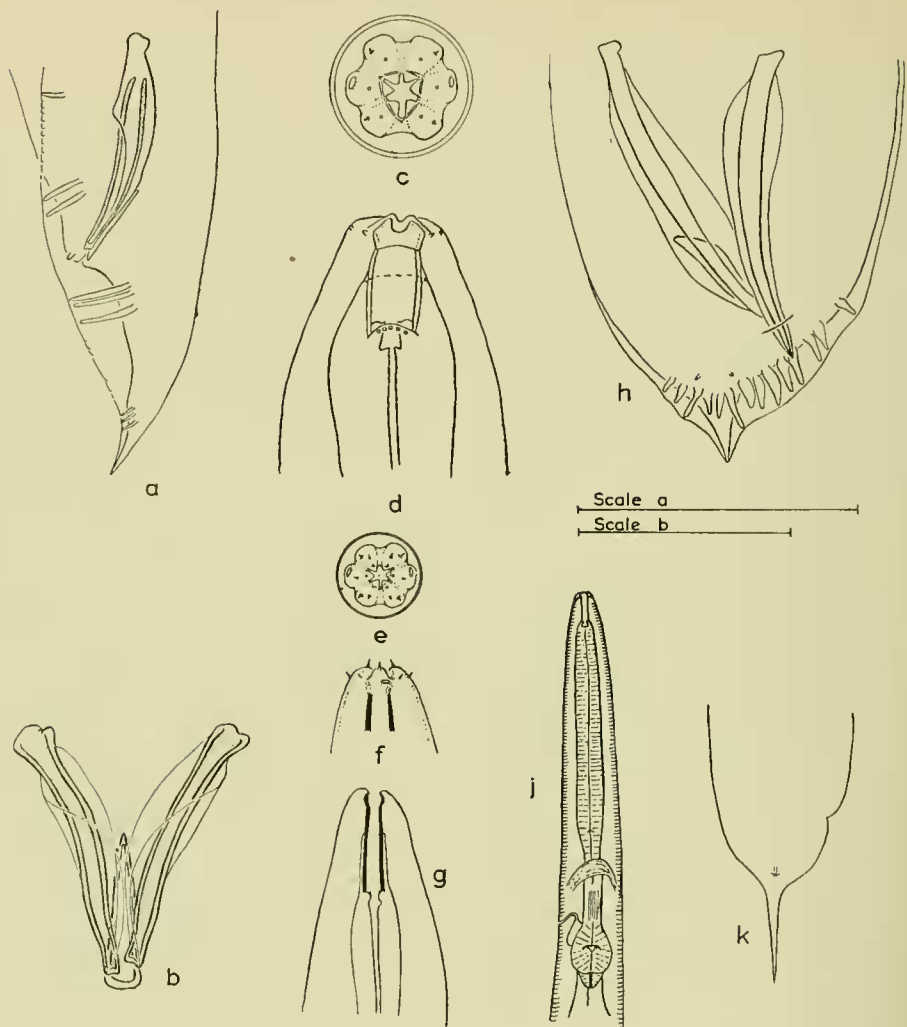


FIG. 2. *Rhabditis marina*, posterior end of male (lateral view) (a), ventral view of spicules and gubernaculum (b), *en face* view of head (♀) (e), lateral view of head with the dorsal surface to the right (f), optical section through buccal cavity and anterior end of oesophagus (g); *Rhabditis ehrenbaumi*, *en face* view of head (c), dorsal view of head showing five tubercles on the metastome (d), semi-ventral view of male tail showing the distribution of the caudal papillae in detail on one side only (h), posterior end of female (i); *Rhabditis bengalensis* sp. nov., structure of oesophagus (redrawn after Timm), note particularly the lack of a distinct median bulb (j). (a, g and k to same scale a; b, c, d, e, f and h to same scale, b; both scale lines = 0.05 mm.)

pairs of long narrow caudal papillae, or rays, arranged in definite groups: one pair far anterior, a group of two pairs mid-way between the most anterior pair and the cloacal opening, a group of three pairs very close together just posterior to the cloacal opening and a final group of three pairs just anterior to the posterior tip of the tail (Text-fig. 2a). The two anterior pairs of papillae in the more anterior group of three are very close together and can frequently be resolved only with great difficulty. The phasmids open on the ventral surface of the tail just anterior to the most posterior group of papillae. There is, in addition, at least one pair of sessile papillae on the anterior lip of the cloacal opening and possibly a second pair on the posterior lip. The spicules are equal in length, 0.40-0.70 mm., identical in structure and are not

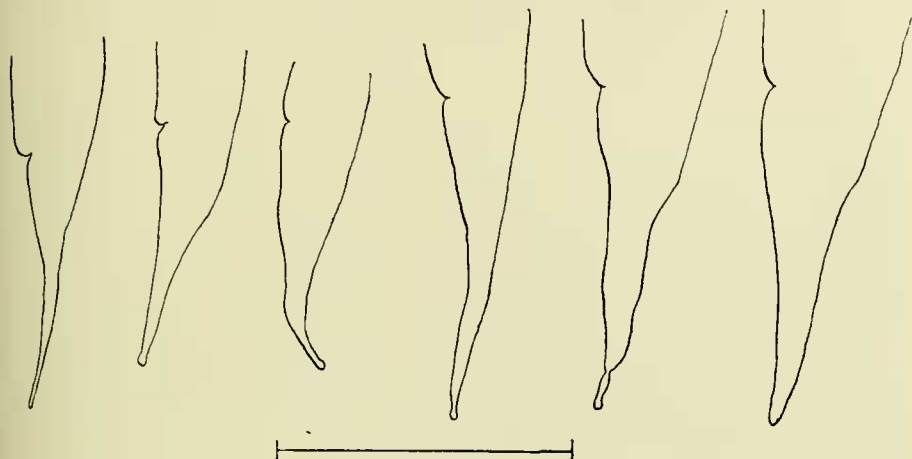


FIG. 3. *Rhabditis marina*, variation in female tail. (Scale line = 0.1 mm.)

fused. They terminate posteriorly in "doubled" swollen ends (Text-figs. 2a and b) and bear broad double alae which are slightly folded over the main central shaft forming open tubes in all the specimens studied. The gubernaculum is broader posteriorly than it is anteriorly and is about half as long as the spicules. There is only one testis, which is flexed, and posteriorly there appears to be a pair of rather short ejaculatory glands.

Female

The vulva opens on the ventral surface of the body slightly posterior to the middle of the body length, V varying from 50-54%. The tail is long and somewhat variable in shape. It ranges from a very long, narrow form with a fine tip in the immature females to a relatively short stout form without such a tip in mature specimens. The range of variation is illustrated in Text-fig. 3 and it appears that as the width of the body increases with the appearance and development of eggs the tail becomes

wider and shorter, with the result that a constriction appears slightly anterior to the end; this is the tail form that Osche considered to be diagnostic of the subspecies *Rh. m. septentrionalis*. Finally the extreme posterior tip of the tail may become lost. The shape of the female tail has been used as the distinguishing character separating the two subspecies, *marina* and *septentrionalis* (see Osche, 1954), but it is clear that the reliance put on it has been misplaced. The reproductive system is amphidelphic and didelphic (as defined by Chitwood and Chitwood, 1950) (Text-fig. 1a). The ovaries are reflexed and there are short oviducts which are swollen just before the uteri to form large sacks which appear to function as spermathecae; there is no indication of spermathecae in the uteri. The uteri are large; in mature females they are packed with a large number of eggs and in the most mature specimens larvae are also present (Text-fig. 1a). The eggs are relatively small and spherical, 0.036–0.045 mm. in diameter.

Discussion

Six varieties of *Rh. marina* have been named of which one appears to represent a distinct species, one—possibly two—should be treated as a *nomen dubium* and the remaining four (or three) are indistinguishable, thus var. *danica* Allgén, 1933 (a name proposed for the description of *Rh. marina* given by Ditlevsen, 1912) has, according to the description, nine pairs of caudal papillae, or rays, on the male tail, arranged in groups of 2, 2, 3, 2 (from the figure of the lateral aspect) or 1, 2, 3, 2 (from the ventral view); var. *kielensis* Schulz, 1932 was described as having seven pairs arranged 1, 2, 3, 1; var. *nidrosiensis* Allgén, 1933 was proposed for one male specimen which apparently had seven pairs of papillae, but as the description is insufficient for identification we propose to treat this as a *nomen dubium*; var. *norwegica* Allgén, 1933 was proposed for one female specimen which was probably a young female of *Rh. marina* and, in spite of the very poor description and figures, we propose to treat it as a synonym of *Rh. marina* (it might be better to treat this as another *nomen dubium*); var. *septentrionalis* Steiner, 1921 was a name proposed by Steiner for the specimens described by him in 1916 and was based on females only. The arrangement of the papillae on the male tail typical of *Rh. marina* is 1, 2, 3, 3, of which one of the pairs in the last group can be easily overlooked as has probably been done by Ditlevsen (1912) (we consider his lateral view of the male tail showing two papillae anteriorly to be faulty), Schulz (1932) and de Coninck and Schuurmans Stekhoven (1933) where fewer than three pairs of papillae are shown in the terminal group. Osche (1954) has suggested that these reported differences may represent natural variation but, while agreeing that this is possible, we feel it more probable that the papillae have simply been overlooked, particularly as we have found no variation in all the specimens we have studied.

Osche (1954) reviewed all the varieties and concluded that there were only two sub-groups which he treated as subspecies, *Rh. marina marina* and *Rh. m. septentrionalis*. He referred all the varieties listed above to the second sub-species which he considered to differ from the first in that the female tail ended in a relatively long, sharply pointed tip in *septentrionalis* and was stouter and blunter in *marina*. We agree with Osche that the various varieties are indistinguishable, with the reservation

that var. *nidrosiensis* cannot be placed, but we cannot accept the separation into two subspecies. That such a separation is unacceptable is shown by the outlines of the female tails reproduced in Text fig 3 from which it can be seen that the range of variation includes both types of tail and also some which have not been graded with varietal names. We therefore recognize none of the varieties or subspecies and treat all the names proposed—with the exception of *Rh. marina* var. *bengalensis* (see below, page 327)—as synonyms of *Rh. marina*.

Rh. marina has been reported from many localities on the coasts of Europe and we have been able to find it almost everywhere we have looked on the South and West Coast of England (always in association with rotting sea-weed) while Mr. Douglas Bremner, who at our request looked for it at Aberdeen, had no difficulty in finding it there also. There are six reports of its occurrence outside Europe, twice from the U.S.A. (Chitwood, 1951; Timm, 1956), once from the Southern Pacific (Allgén, 1932), once from the Falkland Islands (Allgén, 1959), once from the Bay of Bengal, Pakistan (Timm, 1956) and several times from the beach at Pernambuco, Brazil (Gerlach, 1956). Chitwood recorded one female from Long Island, N.Y., and Timm (1956) mentions that he found males at Woods Hole. Gerlach's specimens were identified by Dr. Arwed H. Meyl who has studied European specimens (see Meyl, 1955) and it cannot be doubted that *Rh. marina* occurs on both sides of the Atlantic Ocean. Allgén (1932) reported *Rh. marina* from Campbell Island, South Pacific (52° 34' S. 169° 12' E.) but the validity of the identification, which was based on one female specimen, must be considered very doubtful although Osche (1954) apparently accepts it. The record of *Rh. marina*, by the same author (Allgén, 1959), from the Falkland Islands appears to be slightly more reliable although the figure of the male tail is too poor to allow us to be certain.

The position of the remaining variety, *Rh. m. bengalensis* Timm, 1956 (referred to as *Pellioditis marina* var. *bengalensis*, n. comb. by Timm (1960)) is different. It was based on one male specimen (collected from "Sonadia Island, Cox's Bazar, Bay of Bengal, East Pakistan") which Timm considered to be distinct in having nine pairs of caudal papillae arranged 1, 1, 1, 3, 3, since, as he rightly points out, the typical *marina* arrangement is with the second and third pairs (from the anterior end) very close together, while in his specimen they are far apart. This distribution is clearly shown in his figure. Also the figure of the oesophagus shows it to be different in outline from that typical of *Rh. marina*, so much so that we feel it probable that, unless the figure is completely inaccurate, Timm was dealing with a different species. The corpus of the oesophagus is the same width all along its length so that there is no distinct middle bulb (See Text-fig. 2j—Timm's figure redrawn) and we feel that this, in conjunction with the distribution of the caudal papillae and the apparently sharp posterior points to the spicules (although this is possibly an unreliable character since Timm's figure of the male tail is clearly somewhat diagrammatic) warrants the treatment of this variety as a distinct species, *Rh. bengalensis* Timm, 1956.

Bresslau and Schuurmans Stekhoven, in Schuurmans Stekhoven (1935) described a new species, *Rh. velata*, from Heligoland. The description was based on one male and one female, the male apparently differing from *Rh. marina* particularly in the

form of the spicules and the shape of the tail. We have seen one male specimen which on first examination appeared to belong to, and was initially referred to this species, but a more careful study showed it to be a poorly preserved specimen of *Rh. marina*, or a late fourth-stage larva, in which the caudal alae appeared to be more extensive than usual and in which the form of the spicules could only be established with difficulty. The appearance of the specimen is so very similar to the figure given by Bresslau and Schuurmans Stekhoven for *Rh. velata* that we have no hesitation in referring that name to the synonymy of *Rh. marina*.

Rhabditis fluviatilis Bütschli, 1876 was redescribed by Hirschmann (1952); Osche (1954) then drew attention to the great similarity between it and *Rh. marina* but said that he was unable to decide whether or not they were indistinguishable since his specimens of *Rh. marina* were in such a poor condition that he was unable to determine the form of the amphids or to establish the presence of lateral fields. Meyl (1955), however, considered *Rh. fluviatilis*, from Magdeburg, to be indistinguishable from *Rh. marina* var. *septentrionalis*, also reporting *Rh. m.* var. *marina* from the same area. We are able to confirm the validity of this synonymization since our specimens agree in all particulars with the descriptions given by both Bütschli and Hirschmann. Further evidence in support of this conclusion, and also our refusal to accept two subspecies, is given by Andrassy (1958) who figures the range of variation in the shape of the female tail in *Rh. fluviatilis* (see Andrassy, 1958. Text-fig. 11, C-E).

The records of *Rh. marina* show it to be widespread on the coasts of Europe and the Mediterranean (see records from the coast of Algeria in Gerlach, 1954b). It also appears probable that it is common on the Atlantic coasts of both North and South America but there are no wholly reliable records of it occurring anywhere else, although it may later be shown to be cosmopolitan. The records from "non-marine" localities, all of which are European, generally refer to it as a rare species from habitats characterized by extreme decomposition (Hirschmann, 1952 and, probably, Bütschli, 1876). Hirschmann records it at Regnitz and Pegnitz, Bavaria from "Wasser . . . trüb und stinkend . . ." while Meyl (1955) reports it, also as a rare species, from several localities of fairly high salinity (Salzbiotopen) near Magdeburg and Andrassy (1958) reports it from Hungary as a rare species in heavily manured soil.

As Osche (1954) has pointed out, many of the records of so called marine species of *Rhabditis* clearly represent species which have been swept into such localities by accident and cannot be considered true marine forms. The position with *Rh. marina* seems to be slightly different but we would still consider it a terrestrial saprophagous form which is able to survive under conditions of fairly high salinity. Many of the records of this species refer to specimens found in association with seaweeds in the littoral zone, but in most cases very few specimens have been found. On the other hand Ditlevsen (1912) obtained relatively large numbers of specimens from putrefying sea-weed and we also found large numbers under similar conditions. It appears that *Rh. marina* is characteristic of such conditions of fairly extreme decomposition and it is clear that the specimens found in the littoral zones have been swept there by accident and almost certainly cannot live and reproduce under such

conditions. Nevertheless *Rh. marina* is unusual in being the species of *Rhabditis* most commonly found on beaches so that it can be considered to represent a form which is adapted to living under semi-marine conditions and must be treated as a typical member of the beach fauna.

Rhabditis (Pellioiditis) ehrenbaumi Bresslau and

Schuermans Stekhoven, 1935

Synonymy :

Rhabditis ehrenbaumi Bresslau & Schuurmans Stekhoven, in Schuurmans Stekhoven, 1935.

Tierw. N. -u. Ostsee 5 (b) : 155. Figs. 3392-c; Bresslau & Schuurmans Stekhoven, 1940.

Marine Freilebende Nematoda aus der Nordsee, Bruxelles, p. 70. Taf. XIV, Abb. 80-81.

Rhabditis (Choriorhabditis) ehrenbaumi, Osche, *Zool. Jb. (Syst. etc.)* 81 : 263.

Rhabditis (Pellioiditis) ehrenbaumi, Dougherty, 1955. *J. Helminth.* 29 : 131.

Type locality : among *Ceramium rubrum*, Heligoland (no more precise locality given).

Material studied

5 ♂, 8 ♀. (B.M. (N.H.) Reg. Nos. 1960.32-41) from among rotting sea-weed and other plant matter cast up on beach, just above high water mark, at Neyland, Pembrokeshire, South Wales (August, 1959).

6 ♂, 6 ♀, 3 4th-stage larvae. (B.M. (N.H.) Reg. Nos. 1960.1213-1227) from among very rotten and strong smelling sea-weed and other plant matter on beach at bottom of cliff path, Jennycliffe Bay, Plymouth (July, 1960).

A few specimens were also found in rotting sea-weed mixed with other plant matter, high on the beach at Weston-Super-Mare, Somerset. *Rh. marina* was also present (see record above), (November, 1960).

Measurements : (specimens fixed in cold formalin and mounted in glycerine).

From Neyland

Males (5)

Body length

(mm.)	<i>a</i>	<i>b</i>	<i>c</i>	V
0.89	17.0	4.1	32.0	—
0.96	13.8	3.4	27.4	—
1.05	16.8	3.2	25.3	—
1.28	17.0	4.1	32.0	—
1.28	18.3	3.9	32.0	—

Females (8)

1.01-1.45	1.4-1.8.2	3.6-4.6	17.5-22.7	53-60
(1.271 ± 0.145)	(16.08 ± 1.45)	(4.01 ± 0.118)	(20.09 ± 1.382)	(56.1 ± 2.21)

From Jennicliffe Bay

Males (6)

Body length (mm.)		<i>a</i>		<i>b</i>		<i>c</i>		V
1.33	.	16.6	.	4.0	.	33.3	.	—
1.34	.	16.7	.	4.2	.	33.5	.	—
1.47	.	21.0	.	3.8	.	49.0	.	—
1.51	.	18.9	.	4.3	.	37.7	.	—
1.60	.	17.8	.	4.7	.	53.3	.	—
1.64	.	20.5	.	4.3	.	41.0	.	—

Females (6)

1.38	.	15.3	.	3.6	.	19.7	.	52.9
1.49	.	14.9	.	4.0	.	24.8	.	52.3
1.56	.	19.5	.	4.2	.	22.3	.	55.8
1.62	.	20.3	.	4.1	.	18.0	.	53.7
1.62	.	20.3	.	4.2	.	20.3	.	54.3
1.64	.	18.2	.	3.9	.	18.2	.	56.7

Larvae

0.75	.	15.0	.	3.4	.	9.4	.	—
0.89	.	22.2	.	3.4	.	11.1	.	—
0.97	.	19.4	.	3.6	.	9.7	.	—

MORPHOLOGY

General

The body is relatively stout and terminates posteriorly in a very short tail in both sexes. The specimens are in rather poor condition; they were killed and fixed in cold formalin. There are no lateral fields but there appear to be distinct narrow lateral alae running almost the full length of the body in both sexes. The oesophagus is typical with the anterior part roughly the same width as the posterior isthmus. The valves in the posterior bulb are marked with concentric semi-elliptical ridges as in *Rh. marina* and the metastome bears five tubercles.

Head

The head is very similar to that of *Rh. marina* and the distribution of the cephalic papillae seems to be the same, except that we have been unable to find any indication of an inner circle of papillae. Although the outer two pairs of papillae are slightly setiform, those of the inner circle appear to be wholly sessile. The amphids are relatively prominent and the structure of the lip-lobes and the underlying lining of the buccal cavity is identical with that of *Rh. marina* (Text-fig. 2c).

Male

The tail is short and broad, with very narrow caudal alae beyond which the terminal spike of the tail does not project. There are ten pairs of narrow papillae, or rays, supporting the alae, of which the most anterior pair lies alone, slightly

anterior to the cloacal opening, followed by a group of seven pairs which are all roughly the same size except for those making up the second pair from the posterior end which are distinctly longer and narrower than the others. The phasmids open on the ventral surface of the tail just anterior to the long pair of papillae (Text-fig. 2*h*). The spicules are equal in length, identical in structure and are not fused. They terminate posteriorly in simple sharp points and bear rather broad double alae. The gubernaculum is about one third the length of the spicules and widens anteriorly. There is a single testis which is reflexed and which does not appear to have any ejaculatory glands (Text-fig. 1*c*).

Female

The reproductive apparatus is amphidelphic and didelphic with oviducts modified as spermathecae as in *Rh. marina*. The eggs are relatively large and are spherical

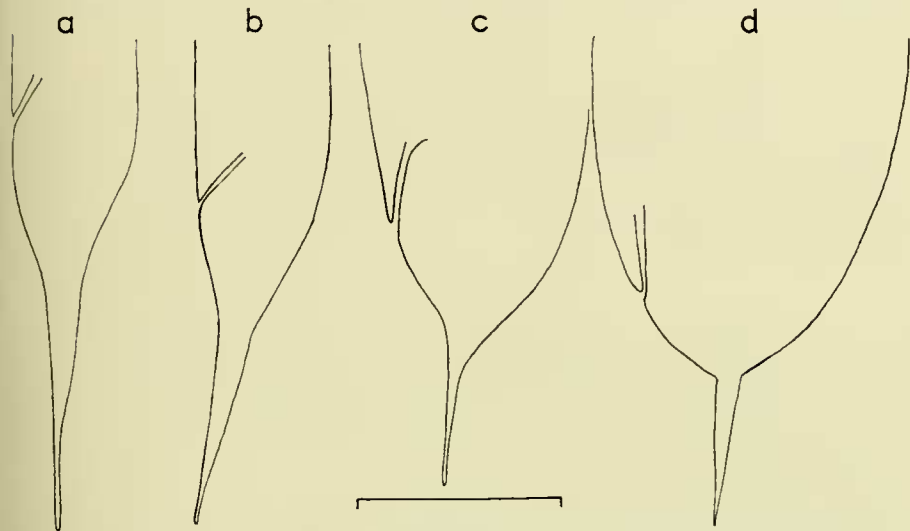


FIG. 4. *Rhabditis ehrenbaumi*, outline of tail: *a* and *b*, larvae; *c* and *d*, adults. (Scale line = 0.05 mm.)

in shape, about 0.035–0.045 mm. \times 0.070–0.095 mm. in size. The greatest number seen in the uteri at one time is six (Text-fig. 1*b*). The tail is short and very stout with a fine evenly narrowing terminal spike (Text-fig. 2*k* and Text-fig. 4). The phasmids open just anteriorly to the commencement of the terminal spike. The vulva opens slightly posteriorly to the middle of the body, V = 52–68.

Larva

The fourth-stage larva is very similar to the adults, the only marked difference, other than those shown by the reproductive organs, is in the shape and proportions

of the tail. In the larvae it is much less stout, is relatively longer and tapers more evenly than in the adult (Text-fig. 4). This is shown most clearly by the low value of "c" (body length/tail length) in the larvae compared with the adults.

Discussion

This species, like *Rh. marina*, appears to be a terrestrial saprophagous form whose presence among *Ceramium rubrum* at Heligoland was accidental, since the decomposing matter among which we found it, although largely composed of sea-weed, contained straw and other rotting terrestrial plant remains at all localities. Further, the habitats at the localities in which it was found were relatively much higher up the beach than those from which *Rh. marina* alone was obtained and it is doubtful if this species may even be considered a typical member of the beach fauna as *Rh. marina* certainly can be. The whole question cannot be resolved at this time as our records are the first reports of this species since the original description.

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REFERENCES

- ALLGÉN, C. A. 1932. Weitere Beiträge zur Kenntnis der marinen Nematodenfauna der Campbellinsel. *Nytt. Mag. Naturv.* **70** : 97-198.
- 1933. Freilebende Nematoden aus dem Trondhjemsfjord. *Capita Zool.* **4**, Afh. 2 : 1-162.
- 1950. Westschwedische marine litorale und terrestrische Nematoden. *Ark. f. Zoologi*, Ser. 2, **1** : 301-344.
- 1959. Free-living marine nematodes. *Further zool. Res. Swed. Antarct. Exped.* **5** (2) : 1-293.
- ANDRÁSSY, ISTVAN. 1958. Szabadonéto fonálférgek Nematoda Libera. [Fauna Hung. 36] *Mag. Allatvil.* **3** (1) : 1-362.
- BASTIAN, H. C. 1865. Monograph on the Anguillulidae, or Free Nematodes, marine, land and freshwater with descriptions of 100 new species. *Trans. Linn. Soc. Lond.* **25** : 73-184.
- BRESSLAU, E. & SCHUURMANS STEKHOVEN, J. H., Jr. 1940. *Marine Freilebende Nematoden aus der Nordsee*. 74 pp. Bruxelles: Musée royal d'Histoire naturelle de Belgique.
- BÜTSCHLI, O. 1876. Untersuchungen über freilebende Nematoden und die Gattung *Chaetonotus*. *Z. wiss. Zool.* **26** : 363-413.
- CHITWOOD, B. G. 1951. North American Marine Nematodes. *Texas J. Sci.* **4** : 617-672.
- CHITWOOD, B. G. & CHITWOOD, M. B. 1950. *An Introduction to Nematology*. Section I. Anatomy. Revised edition.
- DE CONINCK, L. A. P. & SCHUURMANS STEKHOVEN, J. H. Jr. 1933. The freelifving marine nemas of the Belgian coast. II. *Mém. Mus. Hist. nat. Belg.* **58** : 1-163.
- DITLEVSEN, H. 1912. Danish freelifving nematodes. *Vidensk. Medd. naturh. Foren. Kbh.* **63** : 213-256.
- GERLACH, S. A. 1954a. Die freilebenden Nematoden der schleswig-holsteinischen Küsten. *Schr. naturw. Ver.* **27** : 44-69.

- GERLACH, S.A. 1954b. Nematodes marins libres des eaux Souterraines Littorales de Tunisie et d'Algeri. *Vie et Milieu*, **4**: 221-237.
- 1956. Die Nematodenbesiedlung des tropischen Brandungsstrandes von Pernambuco. Brasilianische Meeres-Nematoden II. *Kieler Meeresforsch.* **12**: 202-218.
- HIRSCHMANN, H. 1952. Die Nematoden der Wassergrenze mittelfrankischer Gewässer. *Zool. Jb. (Syst. &c.)* **81**: 313-407.
- MEYL, N. H. 1955. Freilebende Nematoden aus binnenländ Salzbiotopen zwischen Braunschweig Magdeburg. *Arch. Hydrobiol.* **50**: 569-614.
- OSCHE, G. 1954. Ein Beitrag zur Kenntnis mariner *Rhabditis*-Arten. *Zool. Anz.* **152**: 242-251.
- OTTO, G. 1936. Die Fauna der Enteromorpha Zone der Kieler Bucht. *Kieler Meeresforsch.* **1**: 1-48.
- SCHULZE, E. 1932. Beiträge zur Kenntnis mariner Nematoden aus der Kieler Bucht. *Zool. Jb. (Syst. &c.)* **62**: 331-430.
- SCHUURMANS STEKHOVEN, J. H., Jr. 1935. Nematoda errantia. *Tierw. N.-u. Ostsee*, **5b**: 173 pp. (Lief. 28).
- STEINER, G. 1916. Freilebende Nematoden aus der Barentssee. *Zool. Jb. (Syst. &c.)*, **39**: 511-676.
- 1921. Beiträge zur Kenntnis mariner Nematoden. *Zool. Jb. (Syst. &c.)* **44**: 1-68.
- TIMM, R. W. 1956. Marine nematodes from the Bay of Bengal. I. Phasmidea. *J. Bombay nat. Hist. Soc.* **54**: 87-90.
- 1960. The widespread occurrence of the hemizonid. *Nematologica*, **5**: 150.

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